No. 626,624. Patented June 6, 1899.

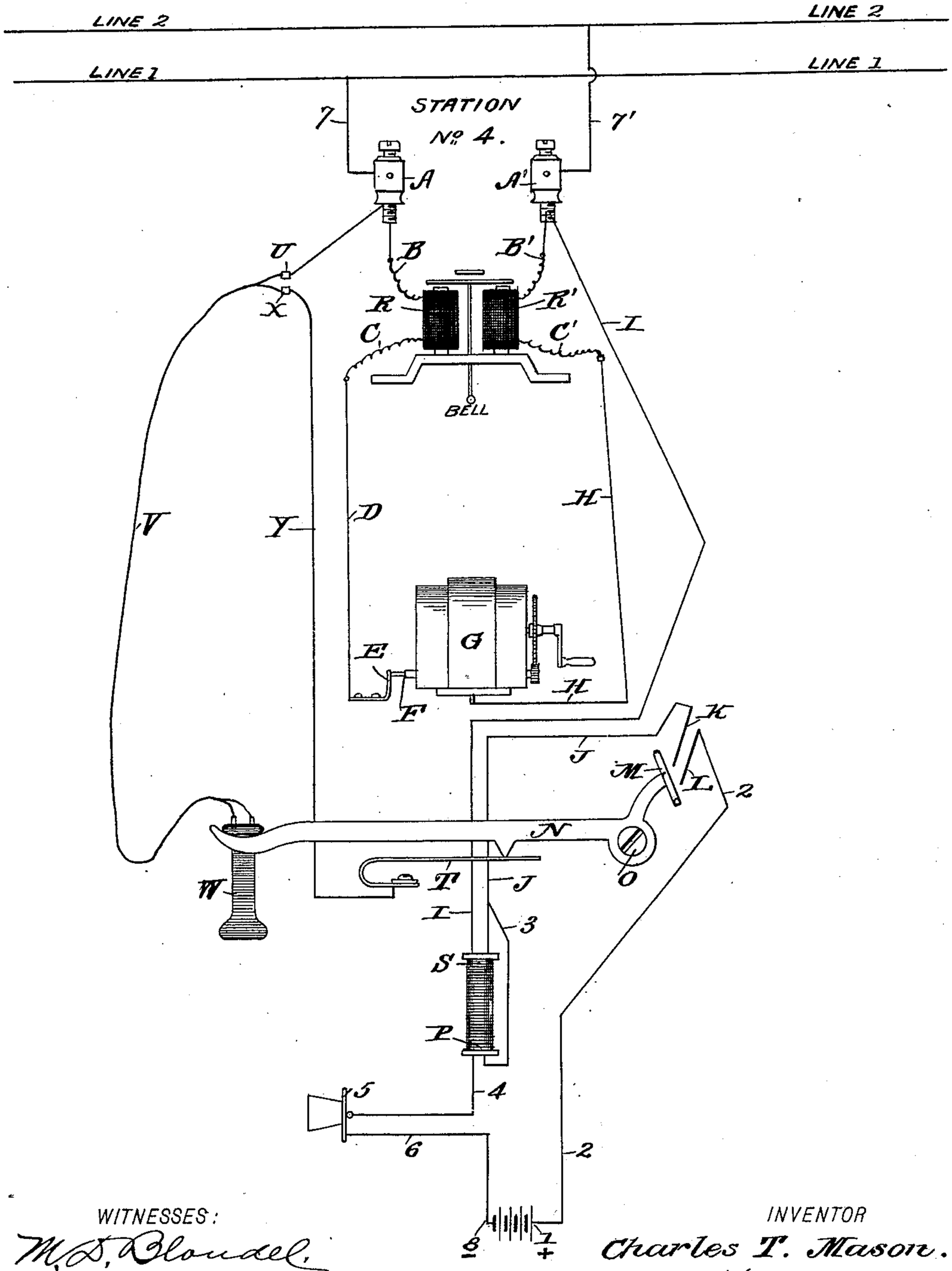
C. T. MASON.

CIRCUIT AND APPARATUS FOR BRIDGING TELEPHONES.

(Application filed Feb. 4, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



WITNESSES:
M. D. Blondel.
Edw. W. Byrn.

INVENTOR
Charles T. Mason.
BY Munn & Co.
ATTORNEYS.

No. 626,624. Patented June 6, 1899.

C. T. MASON.

CIRCUIT AND APPARATUS FOR BRIDGING TELEPHONES.

(Application filed Feb. 4, 1899.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

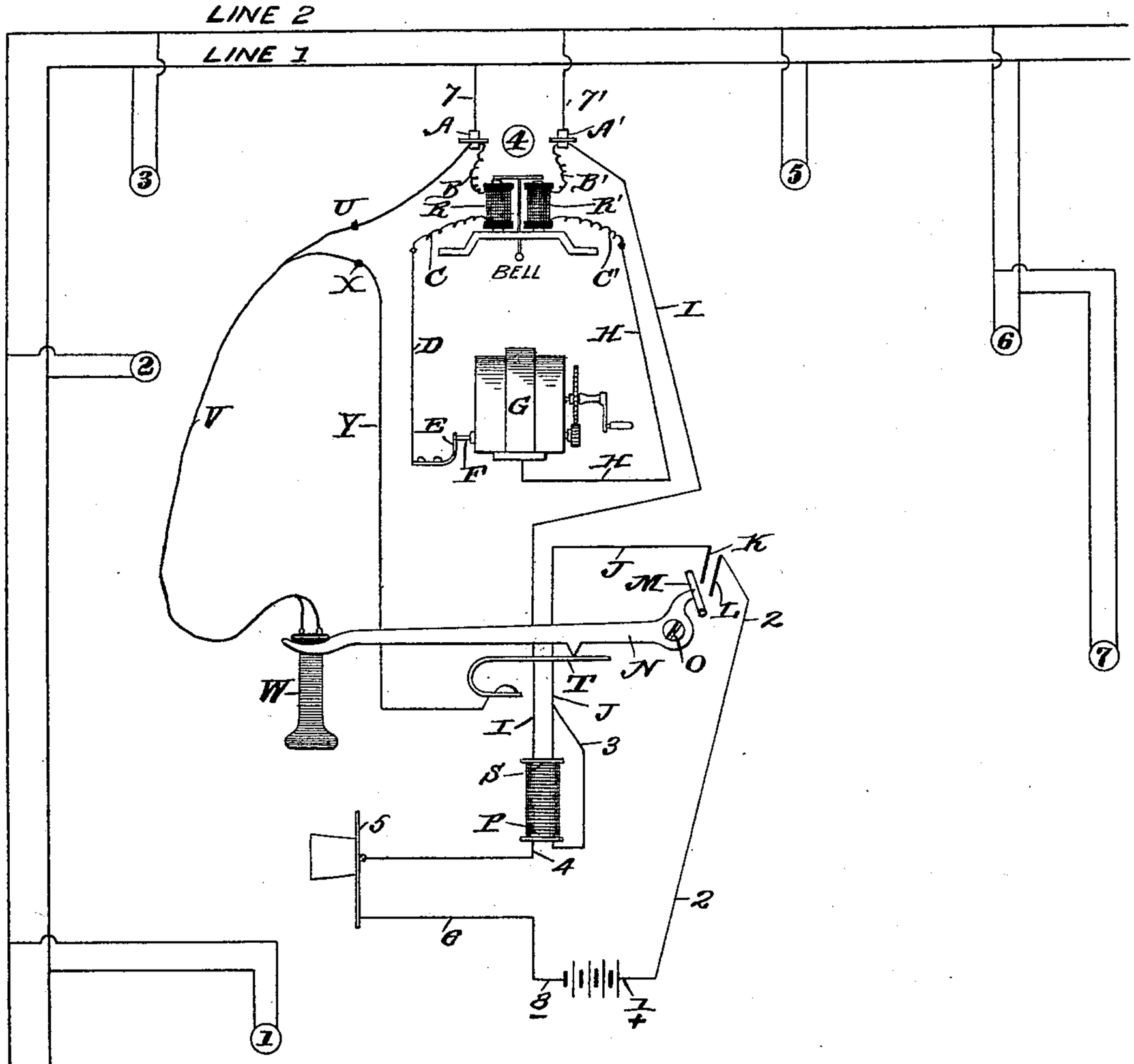
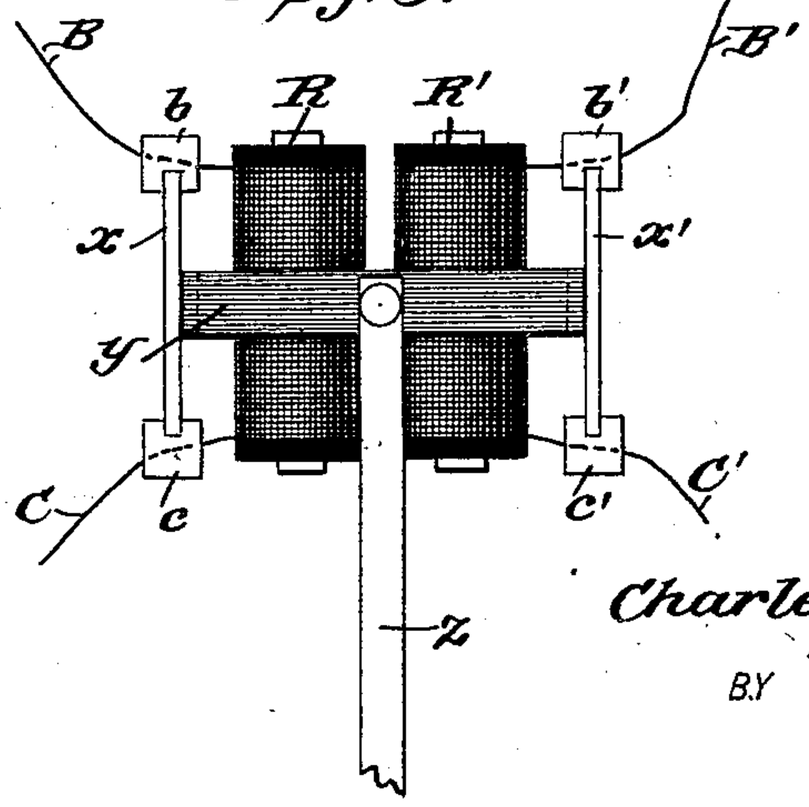


Fig. 3.



WITNESSES:
M. D. Blandell.
Edw. W. Byrn.

INVENTOR
Charles T. Mason.
BY Munn & Co.
ATTORNEYS.

No. 626,624. Patented June 6, 1899.

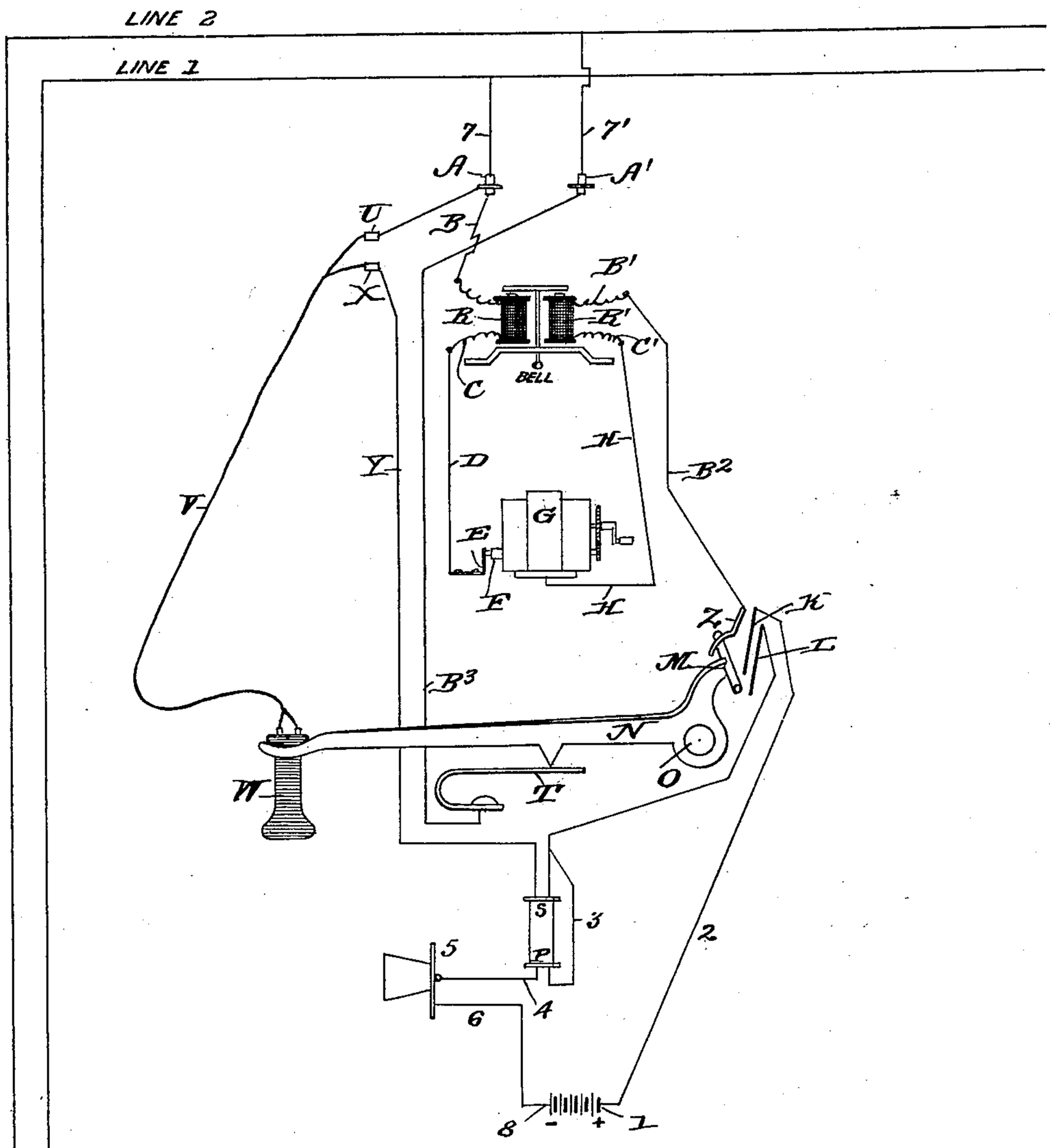
C. T. MASON.

CIRCUIT AND APPARATUS FOR BRIDGING TELEPHONES.

(Application filed Feb. 4, 1899.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 4.



WITNESSES:

M. L. Blondell.

Edw. W. Byrn.

INVENTOR

Charles T. Mason.

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHARLES T. MASON, OF SUMTER, SOUTH CAROLINA.

CIRCUIT AND APPARATUS FOR BRIDGING TELEPHONES.

SPECIFICATION forming part of Letters Patent No. 626,624, dated June 6, 1899.

Application filed February 4, 1899. Serial No. 704,471. (No model.)

To all whom it may concern:

Be it known that I, CHARLES T. MASON, of Sumter, in the county of Sumter and State of South Carolina, have invented a new and useful Improvement in Circuits and Apparatus for Bridging Telephones, of which the following is a specification.

In the art of telephone communication it is often desirable to construct circuits having a number of stations, preferably on a metallic circuit, and to be able from any one station to satisfactorily signal all the other stations, and also to enable the telephonic transmission and reproduction of conversation between any desired two of the said stations to be successfully effected.

Prior to my invention it was customary to connect the call-bell magnets at the several stations in series in the main-line circuit together with a normally-shunted generator, which circuit was opened or closed by the hook-switch, usually actuated automatically by the removal and replacement of the receiving-telephone, this circuit being opened or short-circuited while the telephone receiving and transmitting instruments were being used and the local-battery circuit closed, or where this system of connecting a call-bell magnet and the generator in series with the main line was not employed it was customary to use call-bell magnets of high resistance connected in parallel with the main line or derived circuits of the main line and to place the call-sending generator (connected to the main line or derived circuit of the main line) in a separate bridged circuit which is normally open or discontinuous, but adapted to be closed while sending a call, the connections of the telephone receiving and transmitting instruments being in a third bridge-circuit at each station, this being also open when the telephone talking-circuits were not in use, but closed in multiple arc with its own bell-magnets and the bell-magnets of other stations while in use. Such an arrangement is described particularly in the patent to Carty, No. 449,106, dated March 31, 1891, in which he specifies the use of high-resistance ringer-coils connected permanently and in independent bridge with the main line. The call-sending generator was connected in a separate bridge with the line and its circuits normally open and adapted when operated to be connected between the two sides of a telephone-circuit in multiple arc with the high-resistance ringer-magnets, as above described. There was therefore at each station one normally-closed or continuous bridged circuit between the line-terminals having in its circuit the high-resistance ringer-coils and two other normally open or discontinuous independent branch circuits between the line-terminals and in multiple arc with each other and the permanently closed bridge of the high-resistance ringer. In one of the two circuits of the normally open bridge was contained a call-sending generator and in the other was included the telephone transmitting and receiving instruments. When sending a call, the bridged circuit containing the generator or source of signaling energy was temporarily closed and the bridged circuit containing the telephone transmitting and receiving instruments was open. When the telephone transmitting and receiving instruments were being used, the bridged circuit containing these instruments was closed and the signaling-circuit open. It is seen, therefore, these normally open circuits were closed only alternately.

My invention, while placing the call-bell magnets in a bridge of the main line after the general manner of the Carty patent, differs therefrom in the following fundamental features: First, my call-bell magnets are not of high resistance, but are of low resistance and do not subserve the special function of the high-resistance magnets in any degree; secondly, I place the generator-armature in series with and between the two helices of the low-resistance bell-magnets—that is, with one coil of the bell-magnet in series between one end of the armature of the generator and one line connection and the other coil of the low-resistance bell-magnet in series between the other end of the armature of the generator and the other line connection—and, thirdly, the generator-armature is in a normally closed bridge of the main line or its equivalent, as hereinafter described.

Figure 1 is a diagram showing the combination of parts of my invention in connection with the circuits at one station. Fig. 2 is a diagram in which the main lines are shown

with six stations connected with same in multiple arc and another station, No. 7, connected in multiple arc with the derived circuit from the main lines connecting station No. 6. Fig. 3 is a detail of a shunt-switch, and Fig. 4 shows a diagram of a slight modification of circuits.

Inasmuch as the apparatus and mode of connecting are the same at all stations, it is necessary to show and describe one only. The apparatus therefore at all stations 1 2 3 5 6 7 are wired the same as shown at station No. 4.

As shown at station No. 4, Fig. 1, R R′ indicate the call-bell magnets, which in my invention are of comparatively low resistance and have the generator in series between the coils of the ringer, one coil of the ringer being in series with one line-terminal and the generator-armature (see circuit A, B, R, C, D, E, and F, which is one of the armature-terminals.) The other ringer-coil is in series with the other line-terminal and the generator-armature (see circuit A′, B′, R′, C′, H) and generator-base G, to which the other end of armature-winding makes electrical connection through the bearings and frame of the generator.

When signaling with the generator G, the circuit passes to main line 1 and 2 through the circuit, as above described, in which one coil of the ringer is in the circuit on each side of the generator-armature; but the ringer as a whole is not in series with the armature. The advantage of placing the ringer-coils on each side of the generator-armature is the protection of the armature from lightning, as the lightning would not pass through the ringer-coils.

With the circuit, including the call-bells, connected at a number of stations on a single line in multiple arc it is of course required that all call-signals transmitted from any station shall ring the bells at all of the stations and that having signaled and attracted the attention of any given station conversation can be readily exchanged therewith and that the loudness of the reproduced speech must not be impaired or perceptibly diminished by the permanent connection between the two main lines 1 and 2. This I accomplish by the presence of the generator-armature connected in series between the ringer-coils in the permanently-bridged circuit, as described, at the unemployed stations, and by this combination of generator and ringer parts produce in this permanently-bridged circuit a high coefficient of self-induction of great impedance to the rapidly-alternating voice-currents and preventing them from short-circuiting or materially weakening by passing through the permanently-bridged circuit of the stations not in use.

As a result of the mass of iron surrounding the generator-armature the retarding effect of impedance to the voice-current in passing through the winding of the generator-armature is sufficient to prevent any injurious passage or short circuit of the voice-current through the permanently-bridged circuit, in series with which are the comparatively low resistance ringer-coils. Having connected this circuit in permanent bridge of the main line, as shown in the diagram of Fig. 1, no other device is necessary; but I may use a push-button or automatic switch to cut out or short-circuit the coils of the ringer while the generator is being used. Such a device is shown in Fig. 3, in which metal bars x and x' on the opposite ends of non-conducting plate y, mounted on spring z, are made to connect plates b c and b' c', respectively, and thus shunt or short-circuit the bell-coils shown at R R′. The outgoing signals are transmitted by hand-generator G, which is included in the permanently-closed bridged circuit. The tendency of such a mode of connection with the ordinary type of series telephone having low-resistance ringers connected in multiple with the main line would be for the ringing-currents to short-circuit through one or two of the nearest of the other instruments. This tendency is with my invention practically obviated by the high self-induction and resistance of the permanently-bridged circuit in which the generator-armature is in series between the ringer-coils and which determines a correspondingly high counter electromotive force in each opposing the passage of the impressed ringing-current and also aiding the said impressed ringing-current in distributing itself impartially between the remaining permanently-bridged circuits.

The telephone receiving and transmitting instruments I place in normally open bridged circuit between the two sides of the line, this being controlled by the automatic switch N. When the receiving-telephone is in place, the telephone bridge-circuit is open or broken between contacts M and K and the local transmitter-circuit is also open or broken between contacts K, L, and M; but by the removal of the telephone-receiver from its support the switch N, turning on its pivot O, is allowed to close the contacts between M and K, which form the secondary or receiver circuit bridge, and also closes the contacts between K, M, and L, which is the local primary or transmitter circuit. The telephone-circuit, therefore, in the phones being used is connected in multiple arc with the permanently-bridged circuit of the generator and ringer coils at its own and all the other stations. These connections may be more easily comprehended by reference to station 4 of Figs. 1 and 2, which is the same as all the stations on the line. It will be seen by reference to the same that each station comprises a normally and permanently closed bridge including the generator-armature in series between the ringer-coils and one normally open bridged circuit including the telephone, adapted when closed for use to form an additional bridge in the same station parallel to the permanent bridge.

Referring to Fig. 1, the various circuits are

traceable as follows: For the station calling and receiving signal the circuit will be from line 1, derived-circuit conductor 7, binding-post A, wire B, ringer-coil R, conductor C D, contact E F, through armature-winding of generator, generator frame and base G, wire H C′, ringer-coil R′, wire B′, terminal A′, and conductor 7′ of derived circuit or loop to main line 2. When receiver W is off the hook, the talking-circuit is from line 1 7, binding-post A to U, through double conductor receiver-cord to receiver and return to binding-post X, conductor Y, to spring T, hook N, contact-point M, to spring K, conductor J, thence through secondary winding of induction-coil S, conductor I, to binding-post A′, thence via conductor 7′ to main line 2. The primary or transmitter circuit is from battery-terminal 1, conductor 2, spring L, contact M to spring K, conductors J 3, through primary of induction-coil P, conductor 4, through electrodes of transmitter 5 and conductor 6 to battery-terminal 8.

As will be seen from the above description and diagram, as per Fig. 1, there will be but two separable contacts in the entire apparatus—namely, the contact in the telephone secondary circuit between hook-head M and spring K and between hook-head M and spring L in the primary circuit. Inasmuch as defects in electrical apparatus develop most frequently at such contacts, it is obviously advantageous to diminish the number of these.

In emphasizing the distinction between my invention and that shown in the Carty patent I disclaim altogether his principle of using in a permanently-bridged circuit ringer-coils of high resistance in connection with a generator in a separate and distinct bridge which is normally open, and in contradistinction thereto I use ringer-coils of comparatively low resistance, with the generator in series between them in the same permanently-closed bridge, which differs not only in the construction and arrangement of the parts, but also in the results.

The invention as so far described refers only to the ringer and magneto parts as being in a permanently-bridged circuit. It is obvious, however, that this is not essertial and that the bridge-circuit containing the bell-magnets and generator as described need not be permanently closed or continuous, since, as is well-known, many bridging telephones employing high-resistance ringer-coils have the bridged circuit of high resistance opened while the instrument is being used for the reproduction of speech, but closed when the telephone is not in use, so as to be in multiple arc with the line to receive its signals.

In Fig. 4 I have shown such an arrangement of circuits and switches as would be applicable to a slight modification of my invention, and by reference to this diagram it will be seen that the bridged circuit containing the bell-magnets and generator-armature and heretofore referred to as permanently closed or continuous may be interrupted or made discontinuous without altering or affecting any of the essential conditions or principles involved.

Referring to Fig. 4, the circuits are traceable as follows: The calling and receiving signal-circuit will be from line 1, derived circuit 7, terminal A, conductor B, low-resistance bell-magnet R, conductors C D, spring-contact E to armature-terminal F, thence through winding of armature and journals and frame of generator to conductors H and C′, low-resistance ringer-coil R′, conductors B′ B^2, spring Z, hook-head M, (which is in contact with spring Z when receiver is on the hook only,) hook N, spring-contact T, conductor B^3, terminal A′, conductor 7′ to line 2. The hook, as shown, is in its normal position while the telephone is not in use and shows the receiver W at rest in the hook-yoke, the gravity of which, overcoming the trend of spring T, causes the hook N to turn on its pivot O and close the contact between M and Z in the generator bridge-circuit.

When receiver W is off the hook, the hook N will be pushed up in the usual manner by the trend of spring T, thereby opening the contact between M and Z and closing contacts L M and K M, controlling the secondary or receiver circuit and the primary or transmitter circuit in their usual arrangement.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A multiple-station telephone-circuit having at each station a normally closed bridge of the main line including both bell-ringing magnets of low resistance and the armature-coils of the generator said bell-magnets being permanently in series with the generator and adapted to be shunted in signaling substantially as shown and described.

2. A multiple-station telephone-circuit having at each station a derived circuit of the main line normally closed when in the signal-receiving position and having within this derived circuit low-resistance bell-magnet coils and the generator-armature arranged in series in relation to each other within this circuit said bell-magnets being permanently in series with the generator and adapted to be shunted in signaling substantially as and for the purpose described.

3. A multiple-station telephone-circuit having at each station a derived circuit of the main line normally closed for the signal-receiving position and having within the same low-resistance bell-magnet coils, and the armature of the generator, one coil of the bell-magnet being connected in series between one side of the generator-armature and one line connection, and the other coil of the bell-magnet being arranged in series between the other side of the generator-armature and the other line connection and both said bell-magnet coils being permanently in series with the

generator and adapted to be shunted in signaling substantially as and for the purpose described.

4. A multiple-station telephone-circuit having at each station a normally closed bridge of the main line and having within this bridge both the coils of the bell-magnet and armature of the generator arranged in series as described and a short-circuiting device for shunting the bell-magnet coils without throwing them in multiple with the generator substantially as and for the purpose described.

CHARLES T. MASON.

Witnesses:
F. C. MANNING,
HIRAM J. GROVER, Jr.